

REMARKS

Currently pending in the application are Claims 1-16, 19, and 21-25.

In view of the following remarks, Applicants respectfully requests consideration by the Examiner and advancement of the application to allowance.

1. Rejection Under 35 U.S.C. § 103(a)

Claims 1-16 and 19-22 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Pat. No. 5,143,945 (Bodnar). It is respectfully submitted that the Examiner has not established *prima facie* obviousness over Bodnar alone.

The Examiner has failed to establish *prima facie* obviousness because Bodnar does not disclose or suggest the organic polyol having at least one aliphatic tertiary amine group as claimed in amended independent claims 1 and 7.¹ In the Office action it is asserted that Bodnar is clear in (1) the suitability of the members ammonia, ethylene diamine, trimethylol propane, and ethylene glycol in forming the polyols of his invention, and (2) the suitability of the molecular weights and functionalities necessary to meet Applicants' claimed hydroxyl equivalent values to form the polyols of their invention.² This assertion is respectfully traversed—nowhere in Bodnar is a reaction system disclosed or suggested that includes the organic polyol of at least independent claims 1 and 7 and claims dependent thereon.

For instance, in his discussion of a polyol component, Bodnar states that the polyol can be any organic compound having at least 2 active hydrogen containing groups and a molecular weight from about 225 to about 12,000.³ But Bodnar qualifies that the lower molecular weight limitation of 225 is “unusually low for the more *conventional* polymeric polyols” and is meant to include “*crude polyester polyols*.”⁴ Thus, Bodnar distinguishes crude polyester polyols from conventional polymeric polyols based on molecular weight.

Bodnar does not teach or suggest the suitability of at least ammonia and ethylene diamine in forming polyols having the number averaged hydroxyl equivalent weight and/or molecular weights as claimed in amended independent claims 1 and 7. For example, Bodnar specifies that his lower molecular weight, crude polyester polyols “are obtained from crude reaction

¹ See also at least claim 11 and new claim 24.

² Paper No. , 20070718 pages 2-3.

³ Bodnar, column 5, line 68-column 6, line 4.

⁴ Bodnar, column 6, lines 11-14. (Emphasis added).

residues...by their *transesterification* with low molecular weight *glycols*.”⁵ There is no indication in this section of Bodnar that his lower molecular weight polyols are obtained any other way. Thus, Bodnar does not teach or suggest suitable employment of an aliphatic tertiary amine within his crude *polyester* polyols.

In contrast, in an embodiment of the Applicants’ invention the primary polyol of the reaction system is *tertiary amine*-containing organic polyol that has a number averaged molecular weight in the range of greater than 200 to less than 1500, and in some embodiments the number averaged molecular weight is greater than 250 to less than 400.⁶ Of course, embodiments are not limited to these examples. Thus, Bodnar does not teach the claimed tertiary amine containing organic polyol much less teach or suggest providing this polyol in the claimed percentages.⁷

Furthermore, Bodnar does not teach or suggest that the lower molecular weight crude polyols are anything other than *polyester* polyols. In other words, there is no indication that Bodnar’s low molecular weight crude polyols are *polyether* polyols. In some embodiments of the present invention, the polyol component may include a blend of additional lower molecular weight *polyether* polyols.⁸ Bodnar’s “conventional polymeric polyols” tend to have higher molecular weights within the range of about 1,000 to about 12,000, and preferably 1,500 to 6,000.⁹ Thus, under an analysis similar to that above, Bodnar does not teach or suggest lower molecular weight polyether polyols much less these polyether polyols in combination with the claimed tertiary amine containing polyol.

In sum, because Bodnar distinguishes between polyols with “unusually low” molecular weights and those that are “conventional,” the Examiner’s inference that Bodnar clearly suggests the use of an aliphatic tertiary amine group to form a polyol of a suitable molecular weight and functionality is respectfully traversed. Given the teachings of Bodnar, there is no reason for one of ordinary skill to do what the Applicants have done. The polyols of Bodnar’s examples are either *polyester* polyols and/or an ethylene glycol initiated polyol. In contrast, the Applicants use lower molecular weight tertiary amine-containing polyols alone or in conjunction with polyether polyols of lower molecular weight.

⁵ *Id.* at lines 58-67. (Emphasis added).

⁶ Published application 2004/0192800 A1 at [0035].

⁷ See, e.g., claims 1, 3, 7, and new claim 24.

⁸ See, e.g. claims 4, 5, 12, and 13.

⁹ Bodnar, column 6, lines 17-21.

The examiner has also failed to establish *prima facie* obviousness for at least one other reason—Bodnar teaches away from the claims. Recently, the Supreme Court indicated that the successful combination of elements can be nonobvious if the prior art teaches away from the claimed combinations.¹⁰ For example, the prior art teaches away from a combination if it warns that risks are involved with certain aspects of the combination.¹¹

Pursuant to Bodnar, fluorocarbon-blown rigid polyurethane foams have superior physical properties as compared to foams blown with carboxylic acids or combinations of water and acids.¹² This is true even if the Index¹³ is high to compensate for the presence of the carboxylic acid.¹⁴ Thus, Bodnar indicates that it is not desirable to make a polyurethane foam without the use of at least some fluorocarbon blowing agent.¹⁵

Bodnar presumably compensates for the alleged inferiority of a rigid fluorocarbon-reduced polyurethane foam by requiring polyisocyanurate linkages in his foams.¹⁶ Toward this end, Bodnar requires an excess of isocyanate to form the required isocyanurate linkages.¹⁷ Specifically, Bodnar requires a trimerization catalyst to “ensure the trimerization of the excess isocyanate groups to isocyanurate linkages.”¹⁸ Thus, Bodnar’s rigid foams are polyurethane-polyisocyanurate foams.¹⁹

In contrast, an embodiment of the Applicants’ foam has a polyurethane network that is tough enough to be used as a structural foam without embedded reinforcement.²⁰ Historically, structural foams are reinforced with a fibrous material that is introduced via a component of a foam reaction mixture.²¹ In this way, the reinforcing fibers are embedded in the bulk of the structural foam.²² But the Applicants have discovered a way to make an embodiment of a structural foam that is stiff, with a high flexural modulus in combination with a high break strain,

¹⁰ *KSR Int’l v. Teleflex Inc.*, 500 U.S. ____ (2007).

¹¹ *Id.*

¹² Bodnar, column 2, lines 13-30.

¹³ Index is the ratio of –NCO groups to isocyanate reactive groups. *See e.g.*, published application 2004/0192800 A1 at [0064].

¹⁴ Bodnar, column 2, lines 13-30.

¹⁵ *Id.*

¹⁶ *See, e.g.*, Bodnar, column 8, lines 11-34. *See also* column 3, lines 38-40.

¹⁷ *Id.*

¹⁸ *Id.* *See also* The Polyurethanes Book, Randall, D.; Lee, S., p. 232 (stating, “polyisocyanurate (PIR) foams are made with indexes in the range of 200 to 350.”), previously submitted.

¹⁹ *See, e.g.*, Bodnar, column 2, lines 39-56.

²⁰ *See* published application 2004/0192800 A1 at [0069].

²¹ *Id.* at [0010]-[0016].

²² *Id.* at [0068].

without such reinforcement.²³ Without being bound by theory, the polyurethane network of an embodiment may be due to monomers (other than isocyanates) in the reaction system.²⁴ In other words, at least the tertiary amine containing organic polyols discussed above react (*e.g.* with isocyanates) to create a tough polyurethane network. Furthermore, an embodiment of the present invention does not include an excessive amount of isocyanate or an isocyanurate catalyst; thus, little, if any, isocyanurate is formed.²⁵ Despite the teachings of Bodnar, the Applicants have achieved an embodiment of a tough polyurethane foam, at a low Index, without using a fluorocarbon blowing agent.²⁶

Given Bodnar's teachings as a whole, it is difficult to envision one of ordinary skill ignoring Bodnar's requirement to provide excess isocyanate and a trimerization catalyst to form isocyanurate linkages. Providing excess isocyanate necessarily increases Bodnar's Index, which teaches away from an embodiment of the present invention. For example, claim 1 calls for an A component and a B component (of a reaction system) that are blended to achieve an Index of 0.8 to 1.3. There is nothing in Bodnar that suggests modifying his system to decrease the excess amount of isocyanate. In fact, doing so would defeat Bodnar's purpose.

The Office action asserts that one having ordinary skill in the art would be motivated by the desire to control isocyanurate linkage contents in the preparations formed in Bodnar to arrive at the products and process of Applicants' claims with the expectation of success.²⁷ This assertion is traversed. Bodnar himself teaches that the physical properties of a *polyurethane* foam made using decreased amounts of a fluorocarbon blowing agent are inferior, and Bodnar requires a polyisocyanurate component in his foam. Thus, if one took Bodnar's teachings as a whole, he or she would be steered away from lowering the Index to produce a polyurethane-based foam, as the resultant foam could have the alleged inferior physical properties. But the Applicants surprisingly found that it is possible to make a polyurethane foam with acceptable structural properties such as a combined high break strain and a high flexural modulus. This is true even when the blowing agent excludes a fluorocarbon. In other words, a fluorocarbon blowing agent is not necessary to embodiments of the Applicants' invention. In sum, there is no reason for one skilled in the art, presented with Bodnar alone, to think that he or she would

²³ *Id.* at [0071]-[072].

²⁴ *Id.* at [0069].

²⁵ *See, e.g.*, new claim 25.

²⁶ *See, e.g.*, at least claim 21.

²⁷ Paper No. 20070718, page 4.